

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Tomoyuki NAKANO et al.
Appl. No.	: 11/508,969
Filed	: April 8, 2005
For	: BULKY PAPER
Examiner	: Dennis R. Cordray
Group Art Unit	: 1731

DECLARATION UNDER 37 C.F.R. § 1.132

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

I, Tomoyuki Nakano, am a co-inventor of the above-identified application and hereby declare as follows:

1. Experiments were conducted by me or under my direct supervision to demonstrate that amphoteric polyacrylamides having an average molecular weight of 2,500,000 to 4,000,000 which fall within the scope of claim 1 amended in the Amendment of February 15, 2007 provide significant effects on physical properties of resultant bulky paper.

2. Example 1

3. 0.9 percent of aluminum sulfate relative to the absolute dry weight of pulp, 0.2 percent of alkylketene dimer relative to the absolute dry weight of pulp as a sizing agent, 0.1 percent of polyacrylamide with an average molecular weight of 2,800,000 relative to the absolute dry weight of pulp, 30 weight percent of calcium carbonate as a filler relative to the weight of paper, and 0.6 percent of KB-110 (manufactured by Kao) as a bulk-increasing agent relative to the absolute dry weight pulp were added to LBKP (CSF freeness 435 ml).

4. The resultant slurry was measured to obtain an amount for producing a paper sheet with a basis weight of 80 g/m<sup>2</sup>, and then the obtained slurry was subjected to a round TAPPI papermaking machine with 150 mesh wire (area 200 cm<sup>2</sup>) to produce a paper. Next, the

Appl. No. : 11/508,969  
Filed : April 8, 2005

paper was dewatered on a press under 4.18 kgf/cm<sup>2</sup> for 5 minutes, followed by 4.18 kgf/cm<sup>2</sup> for 2 minutes, and then dried with a cylinder drier at 110°C for 60 seconds to manufacture a vat paper.

5. Example 2

6. 0.9 percent of aluminum sulfate relative to the absolute dry weight of pulp, 0.2 percent of alkylketene dimer relative to the absolute dry weight of pulp as a sizing agent, 0.1 percent of polyacrylamide with an average molecular weight of 3,800,000 relative to the absolute dry weight of pulp, 30 weight percent of calcium carbonate as a filler relative to the weight of paper, and 0.6 percent of KB-110 (manufactured by Kao) as a bulk-increasing agent relative to the absolute dry weight pulp were added to LBKP (CSF freeness 435 ml).

7. The resultant slurry was measured to obtain an amount for producing a paper sheet with a basis weight of 80 g/m<sup>2</sup>, and then, the obtained slurry was subjected to a round TAPPI papermaking machine with 150 mesh wire (area 200 cm<sup>2</sup>) to obtain a paper. Next, the paper was dewatered on a press under 4.18 kgf/cm<sup>2</sup> for 5 minutes, followed by 4.18 kgf/cm<sup>2</sup> for 2 minutes, and then dried with a cylinder drier at 110°C for 60 seconds to manufacture a vat paper.

8. Comparative Example 1

9. 0.9 percent of aluminum sulfate relative to the absolute dry weight of pulp, 0.2 percent of alkylketene dimer relative to the absolute dry weight of pulp as a sizing agent, 0.1 percent of polyacrylamide with an average molecular weight of 2,000,000 relative to the absolute dry weight of pulp, 30 weight percent of calcium carbonate as a filler relative to the weight of paper, and 0.6 percent of KB-110 (manufactured by Kao) as a bulk-increasing agent relative to the absolute dry weight pulp were added to LBKP (CSF freeness 435 ml).

10. The resultant slurry was measured to obtain an amount for producing a paper sheet with a basis weight of 80 g/m<sup>2</sup>, and then, the obtained slurry was subjected to a round TAPPI papermaking machine with 150 mesh wire (area 200 cm<sup>2</sup>) to obtain a paper. Next, the paper was dewatered on a press under 4.18 kgf/cm<sup>2</sup> for 5 minutes, followed by 4.18 kgf/cm<sup>2</sup> for 2 minutes, and then dried with a cylinder drier at 110°C for 60 seconds to manufacture a vat paper.

11. Comparative Example 2

Appl. No. : 11/508,969  
Filed : April 8, 2005

12. 0.9 percent of aluminum sulfate relative to the absolute dry weight of pulp, 0.2 percent of alkylketene dimer relative to the absolute dry weight of pulp as a sizing agent, 0.1 percent of polyacrylamide with an average molecular weight of 4,500,000 relative to the absolute dry weight of pulp, 30 weight percent of calcium carbonate as a filler relative to the weight of paper, and 0.6 percent of KB-110 (manufactured by Kao) as a bulk-increasing agent relative to the absolute dry weight pulp were added to LBKP (CSF freeness 435 ml).

13. The resultant slurry was measured to obtain an amount for producing a paper sheet with a basis weight of 80 g/m<sup>2</sup>, and then, the obtained slurry was subjected to a round TAPPI papermaking machine with 150 mesh wire (area 200 cm<sup>2</sup>) to obtain a paper. Next, the paper was dewatered on a press under 4.18 kgf/cm<sup>2</sup> for 5 minutes, followed by 4.18 kgf/cm<sup>2</sup> for 2 minutes, and then dried with a cylinder drier at 110°C for 60 seconds to manufacture a vat paper.

14. Measuring Methods

15. The following test methods were used for measuring the physical property values, which are the same test methods as the ones described in the Examples in the present application: Density: JIS P8118; Breaking length: JIS P8113; Hunter brightness: JIS P8123; Hunter opacity: JIS P8138.

16. Results

	Average Molecular weight	Density (g/cm <sup>3</sup> )	Breaking Length (km)	Hunter Brightness (%)	Hunter Opacity (%)
Ex. 1	2,800,000	0.521	3.25	84.4	85.5
Ex. 2	3,800,000	0.523	3.32	84.3	85.4
Com. Ex. 1	2,000,000	0.528	3.14	84.1	85.1
Com. Ex. 2	4,500,000	0.535	3.10	83.9	84.8

17. In my opinion, it is very surprising that when the average molecular weights of amphoteric polyacrylamides described in the amended claim 1 were 2,800,000 (Example 1) and 3,800,000 (Example 2) (i.e., in the range of 2,500,000 to 4,000,000), not only the density of the resultant paper was decreased (i.e., the paper was bulky), but also the breaking length of the paper was increased (i.e., tension strength was high) despite the fact that the density was decreased, as compared with the cases where the average molecular weights were 2,000,000 (Comparative Example 1) and 4,500,000 (Comparative Example 2).

Appl. No. : 11/508,969  
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18. Further, it is very surprising that when the average molecular weights of amphoteric polyacrylamides described in the amended claim 1 were 2,800,000 (Example 1) and 3,800,000 (Example 2) (i.e., in the range of 2,500,000 to 4,000,000), despite the fact that the density of the resultant paper was decreased (i.e., the paper was bulky), the hunter opacity and hunter brightness were increased, as compared with the cases where the average molecular weights were 2,000,000 (Comparative Example 1) and 4,500,000 (Comparative Example 2).

19. The differences in the values between Examples 1-2 and Comparative Examples 1-2 may appear to be small but are in fact significant in the field of bulky paper industry. It is surprising that the amphoteric polyacrylamides having an average molecular weight in the specific range of 2,500,000 to 4,000,000 can improve tensile strength, opacity, and brightness of paper while lowering its density.

20. I hereby declare that all statement made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 101 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Dated: 9, 26, 2007

By: Tomoyuki Nakano  
Tomoyuki Nakano

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